CSE 374
Programming Concepts & Tools

Laura Campbell
(Thanks to Hal Perkins)
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Lecture 16 – Version control and svn
Where we are

• Learning tools and concepts relevant to multi-file, multi-person, multi-platform, multi-month projects
• Today: Managing source code
  – Reliable backup of hard-to-replace information (i.e., sources)
  – Tools for managing concurrent and potentially conflicting changes from multiple people
  – Ability to retrieve previous versions
• Note: None of this has anything to do with code. Like make, version-control systems are typically not language-specific.
  – Many people use version control systems for everything they do (code, papers, slides, letters, drawings, pictures, . . .)
    • Traditional systems were best at text files (comparing differences, etc.); newer ones work fine with others too
      – But be sure to check before storing videos & other media
Version-control systems

• There are plenty: scss (historical), rcs (mostly historical), cvs (built on top of rcs), subversion, git (much more distributed), mercurial, sourcesafe, …

• The terminology and commands aren’t particularly standard, but once you know one, the others aren’t difficult – the basic concepts are the same

• svn was the most widely used for the last decade and is still common – we’ll learn basic svn

• git and mercurial are the hot new thing – distributed version control
  – Same core ideas, but more complicated to support independent development and merging of projects
The setup

• There is a svn repository, where files (and all past versions) are reliably stored
  – Hopefully the repository files are backed up, but that’s not svn’s problem
• You do not edit files in the repository directly. Instead:
  – You check-out a working copy and edit it
  – You commit changes back to the repository
• You use the svn program to perform any operations that affect the repository
• One repository may hold many projects. A subversion repository is just a database of projects and files.
  – Looks like a filesystem tree of project directories
Tasks

Learn the common cases; look up the uncommon ones.

In a production shop...

• Create
  – a repository (rare – every few years)
  – a new project (infrequent – once or twice a year)
  – a working copy of a project (every few weeks or months?)

• Working with files
  – Get updates, add or remove files, commit changes to repository (daily)
  – Check version history, differences (as needed)

• Branches, locks, watches, others (every now and then)

Basic command structure is the same for all

  `svn svn-options cmd cmd-options files...`
Repository access

A repository can be:
• Local: specify repository directory root via a regular file path name url (file:///path...)
• Remote: lots of remote protocols supported (ssh, https, …) depending on repository configuration
  – Specify user-id and machine
  – Usually need svn and ssh installed locally
  – Need authentication (ssh password or other)
• HW6 uses https access to remote server
• Feel free to experiment with private, local repos
Getting started

- Set up a repository (we’ll do this for you on hw6; if you do it yourself you get to pick name, location)
  
  `svnadmin create path/svnrepos`

- Put initial version of project directory in repository (do this once!)
  
  `svn import projdir svn://path/svnrepos/proj -m msg`
  
  - Commands that update a repository require a message (msg) that should briefly document the change
  
  - Once a project is imported, never use the original directory again (never! We really mean that!)
  
  - Path depends on kind of access (local/remote)

- Check out a copy of the project to a working directory
  
  `cd working-directory`
  
  `svn checkout svn://path/svnrepos/proj proj`
  
  - Working directory remembers repository location and password for future checkin, update, etc.

- HW6: path to repository server is on cse server – see writeup
File manipulation

- Add files with `svn add` (won’t be in repository if you don’t)
- Bring local working copy up to date with `svn update` (get changed files from repository)
- Commit local changes with `svn commit`
  - Any number of files including subdirectories recursively if no filename specified
  - Files not actually added to repository until commit
- Commit messages are mandatory
  - `-m “short message”`
  - `-F filename-containing-message`
  - Else pop up editor if `EDITOR` or `VISUAL` environment variable is set
  - Else complain
Some examples

• Update local working directory to match repository
  `svn update`
• Make changes (do via `svn`, not `mv`, `cp`, so repository will also change on commit)
  `svn add file.c`
  `svn move oldfile.c newfile.c`
  `svn delete obsoletefile`
• Commit changes
  `svn commit -m "this is much better, fixes bug 31415"`
• Examine your changes
  `svn status`
  `svn diff file.c`
  `svn revert file.c`
Conflicts

• This all works great if there is one working-copy. With multiple working-copies there can be conflicts:
  1. Your working-copy checks out version 17 of foo
  2. You edit foo
  3. Somebody else commits a new version (18) of foo
• Subversion tries to merge changes automatically; if it can’t you must resolve the conflict. If svn commit fails:
  – Do svn update to get repository version and attempt merge
    • “G” means the automatic merge succeeded
    • “C” means you have to resolve the conflict
  – Merging is line-based, which is why svn is better for text files
  – Conflicts indicated in the working-copy file (search for <<<<<<<<)
  – Recent versions of svn handle more of this automatically or interactively
svn gotchas

- Do not forget to add files or your group members will be very unhappy.
- Keep in the repository exactly (and only) what you need to build the application!
  - Yes: foo.c foo.h Makefile
  - No: foo.o a.out
  - You don’t want versions of .o files etc.:
    - Replaceable things have no value
    - They change a lot when .c files change a little
    - Developers on other machines can’t use them
Summary

• Another tool for letting the computer do what it’s good at:
  – Much better than manually emailing files, adding dates to filenames, etc.
  – Managing versions, storing the differences
  – Keeping source-code safe
  – Preventing concurrent access, detecting conflicts

• svn: full documentation is online, free, downloadable
  http://svnbook.red-bean.com/
  – Chapters 1 & 2 have most of what you’ll need